PCC Pavement Rehabilitation with Hot Mix Asphalt

54th Annual Illinois Bituminous Paving Conference

December 11, 2013

Kevin Burke III, P.E.
Illinois Asphalt Pavement Association
burkeiii.kevin@comcast.net

Assistance Provided By

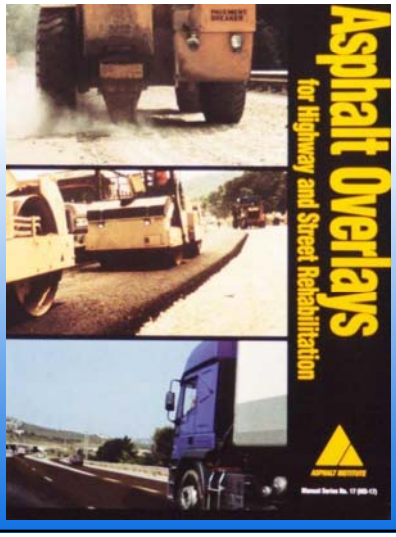
Murphy Pavement Technology
A Division of Murphy Bros. Enterprises Inc.

Tim Murphy, P.E.
TMurphy@murphypavetech.com

Champaign County Highway Department

Jeff Blue, P.E.
JBlue@co.champaign.il.us

Asphalt Institute MS-17



- Chapter 2: Pavement Evaluation
- Chapter 9: Preparing PCC Pavements for HMA Overlays
  - Saw-Cut and Seal/Crack-Relief Layer
- Chapter 10: Fractured Slab Techniques
  - Rubblization/Crack (Break) and Seat
- Chapter 11: Overlay Design for Rigid Pavements
- Illinois Examples

PAVEMENT EVALUATION

Pavement Evaluation

- Functional Characteristics
  - Ride Quality
  - Surface Friction
- Condition & Distress Survey
  - Collection
  - Rating
- Structural Testing
  - Destructive
  - Non-Destructive
- Drainage

Pavement Management System

- Sections 45-3 and 45-4 of BLRS Manual
- ICT R27-087: Implementing Pavement Management Systems for Local Agencies: State-of-the-Art/State-of-the-Practice
- Agency Specific

PASER Condition Ranges			
Excellent		10 – 9	10 – 5: Feasible for pavement preservation
Very Good		8	
Good		7 – 6	
Fair		5 – 4	
Poor		3	4 – 1: Not feasible for pavement preservation
Very Poor		2	
Failed		1	

PAVEMENT PASER CONDITION RANGE CLASSIFICATIONS

Figure 45-4A

CRS Condition Ranges			
Excellent		9.0 – 7.6	9.0 – 6.1: Feasible for pavement preservation
Satisfactory		7.5 – 6.1	
Fair		6.0 – 4.6	6.0 – 1.0: Not feasible for pavement preservation
Poor		4.5 – 1.0	

PAVEMENT CRS CONDITION RANGE CLASSIFICATIONS

Figure 45-4B

PCI Condition Ranges			
Excellent		100-86	100 – 65: Feasible for pavement preservation
Very Good		85-71	
Good		70-56	
Fair		55-41	64 - 0: Not feasible for pavement preservation
Poor		40-26	
Very Poor		25-11	
Failed		10-0	

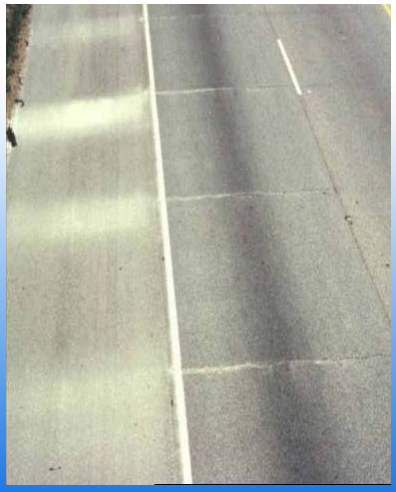
PAVEMENT PCI CONDITION RANGE CLASSIFICATIONS

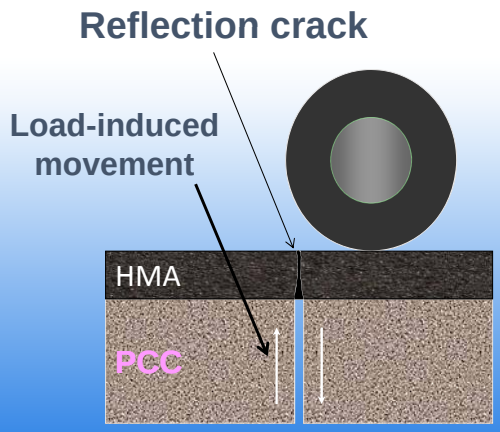
Figure 45-4C

Treatment Selection

- Proof Rolling
- Joint Condition
- Existing Surface
  - Grooved
  - Polished
- Unstable Slabs
- Patching
- Seating
- Undersealing

Reflective Cracking

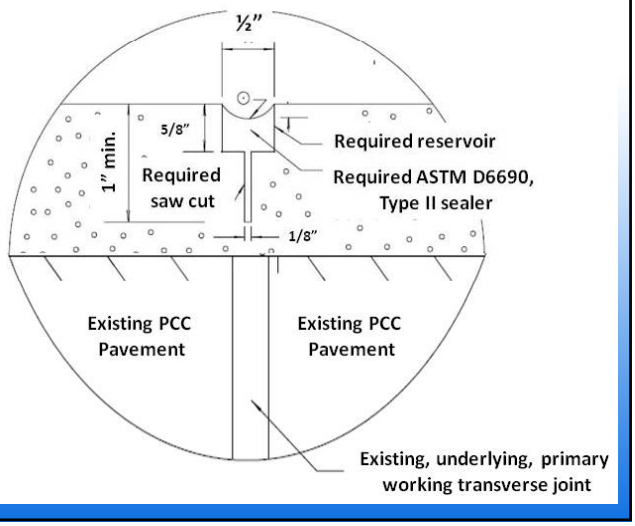




PREPARING PCC PAVEMENTS FOR HMA OVERLAY

Saw-Cut and Seal

- Repair Existing PCC
  - Clean and fill joints
- Locate and Reference Existing PCC Joints
- Place HMA Overlay
- Saw-Cut Directly above Referenced Joints
- Clean and Dry Saw-Cut
- Apply Sealant



Crack Relief Layer

- Open Graded HMA
- Reflective Crack Control Systems
  - Standard Specs Article 443
- 4.75 mm Polymerized HMA
  - Standard Specs Article 1030

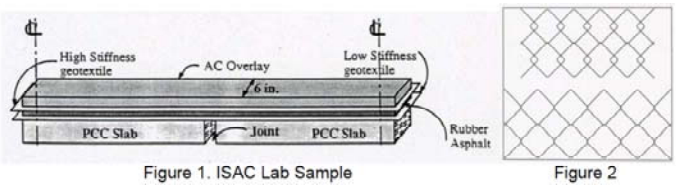


Figure 1. ISAC Lab Sample

Figure 2

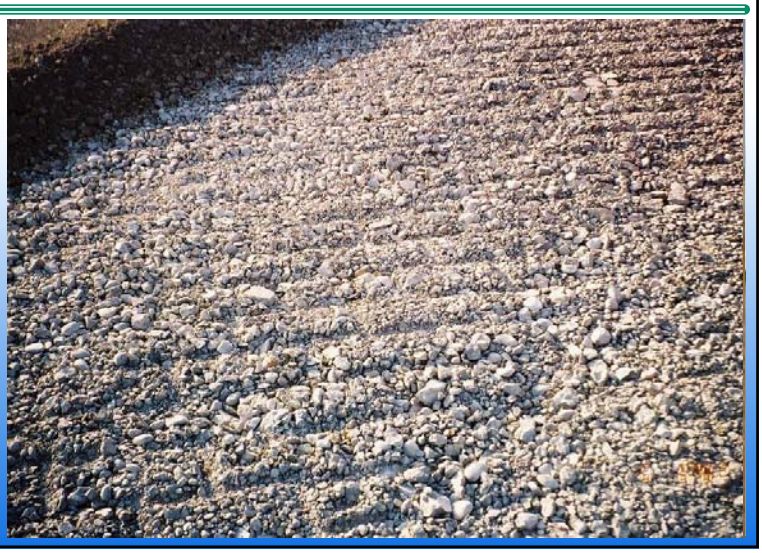
FRACTURED SLAB TECHNIQUES

Crack & Seat

- Correct Drainage
- Crack PCC Slabs
  - "guillotine" hammer
  - 30" or less
- Seat Cracked PCC
  - 35-50 ton pneumatic roller
- Remove / patch soft areas
- Overlay with HMA

Rubblization

- Correct Drainage
- Test Strip/Pits
- Rubblize
- Roll
  - Final sizing
  - Lock in pieces
- Overlay with HMA



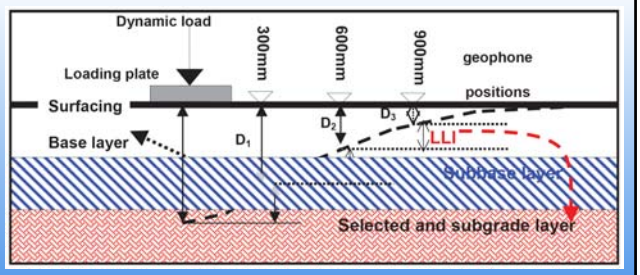
PAVEMENT DESIGN

Functional Overlay

- Policy Decision
- BLRS Manual Section 14-1.02(j)
  - Eligible for State and MFT Funding
  - Maximum 2” Overlay
- BLRS Manual Section 46-3
  - Eligible for Federal, State, and MFT Funding
  - Must Meet Certain Requirments
  - Maximum 3.75” Overlay

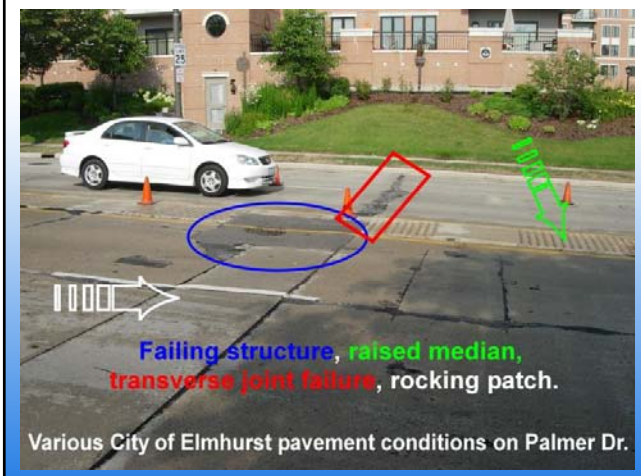
Structural Overlay

- BLRS Manual Section 46-4
  - Modified AASHTO
    - + Determine Requires Structural Number
    - + Assign Structural Number to Existing Layers
    - + Determine Overlay Thickness
  - Falling Weight Deflectometer
    - + Non-Destructive Test
    - + More Accurate
- BDE Manual Section 54-5.03
  - Mechanistic Only Available for Rubblization



PROJECT EXAMPLES

Robert Palmer Drive - Elmhurst



Various City of Elmhurst pavement conditions on Palmer Dr.

- 8” PCC Doweled Pavement
- Significant Joint Failure
- Loss of Friction
- Deteriorating Median
- Poor Cross Slope
- 5,000+ AADT

Robert Palmer Drive Investigation

- Drove project;
  - D- ride quality.
  - Loss of skid resistance.
- Walked project;
  - D cracked panels.
  - Rocking panels.
  - Failing joint materials.


Palmer Dr. concrete patch - undoweled.

Robert Palmer Drive - Opening Joint

Robert Palmer Drive - Opening Joint

Robert Palmer Drive - Recommendations

- Waterproofing
- Patching
  - 6’ wide asphalt patches (curb to curb)
- Joint Preparation
- Cold Mill
  - Rumble median
  - Curb reveal
  - Butt joints
- Spot Mill High Spots
- HMA Overlay
  - ¾” polymerized sand mix level course
  - 2” HMA surface course overlay
  - Isolated saw and seal

Champaign County

- County Road 9 (East of Ludlow) (2005)
  - 9-6-9 Lane (West) and Aggregate Base Lane (East) Pavements from 1930's
  - 4" HMA Overlay
  - 2 miles
- County Road 9 (West of Ludlow) (2007)
  - 9-6-9 Lane (West) and Aggregate Base Lane (East) Pavements from 1930's
  - 5"HMA Overlay
  - 7 miles
- County Road 17 (2008)
  - 7" Jointed 22' Pavement from 1930's
  - 5" HMA Overlay
  - 8 miles

County Road 9 (East of Ludlow)

- Milled Both Sides
- Rubblized Concrete
- 4" HMA Overlay
- Poor Performance
  - Heavy Rain after Rubblization
  - No Drainage

2011 County Highway 9 – West Bound

County Road 9 (West of Ludlow)

- Edge Drains Installed Prior to Rubblization
  - Concrete Side Only
- Milled PCC side
- Modified Rubblized PCC (Less Effort)
- 3” HMA Binder Lift Over Rubblized Base
- Milled 1” of Flexible Lane
- 2” HMA N50 Surface over Both Lanes
- Good Performance (Issues on Flexible Base Side)

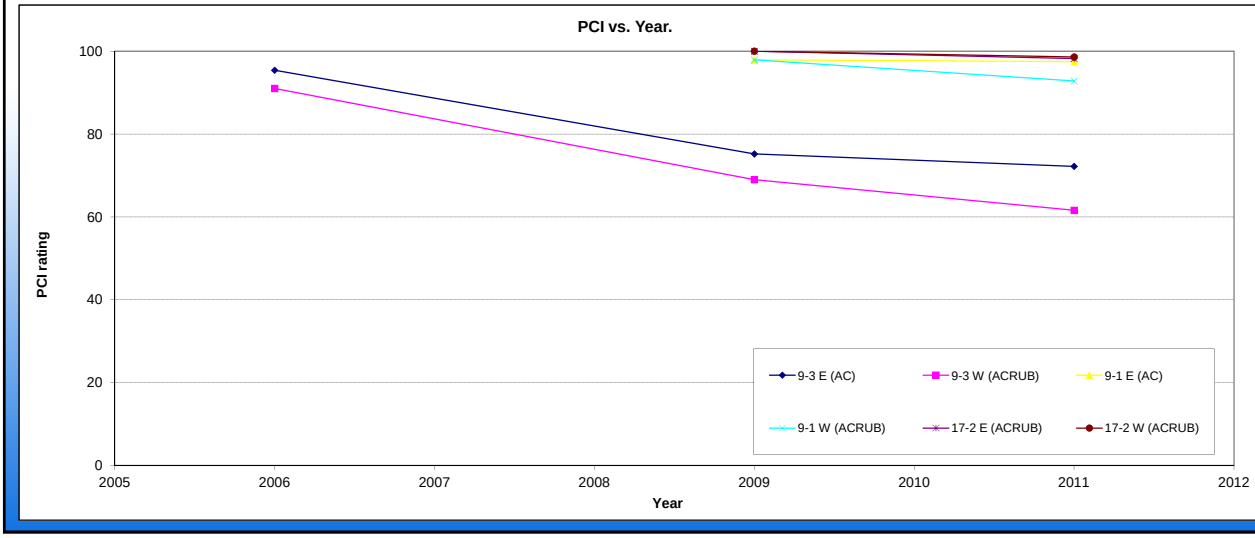
2011 County Highway 9 – West Bound

County Road 17

- Edge Drains Installed Prior to Rubblization
- Milled HMA on One side
- Rubblized PCC on One Side
  - Spec Modification 75% less than 12” in dimension – no fragment exceeding 16”)
- 3” HMA Binder Lift Over Rubblized Base
- Milled 1” of Flexible Lane
- 2” HMA N50 Surface (Full Width)
- Excellent Performance

2011 County Highway 17 – East Bound

PMS Data



Questions & Answers